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ABSTRACT

The Philadelphia City Schools engaged in a four-year program to develop and test dual audio television, a way to help children learn more from the massive amounts of time they spend watching commercial television. The format consisted of an instructional radio broadcast which accompanied popular television shows and attempted to clarify and amplify the vocabulary concepts that were presented. Supplementary audio broadcasts were developed for"Gilligan's Island," "The Flintstones," and "Scooby Doo," and studies were conducted to measure their levels of utilization and their effects on vocabulary development. Results showed that the audience size was insufficient to justify national networking, and the instruction was effective for only a portion of the intended audience. (EMH)

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# DUAL AUDIO TELEVISION

## An Experiment in Saturday Morning Broadcast

## And a Summary Report

by

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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## What Is Dual Audio Television?

Dual audio television instruction is a method of gaining educational benefit from commercial entertainment television programs. The average American child spends about twenty-four hours a week watching television, and most of that time is spent watching entertainment--cartoons and situation comedies--not educational programs. Research indicates that children learn remarkably little vocabulary or other school-related information from the entertainment television programs they watch. Yet entertainment television contains a level of language far above what many children can understand or speak, and a wide variety of concepts which could be useful to them. For instance, in one typical half-hour cartoon program there were over seventy words which were well above the vocabulary level of the average child watching.

Dual audio television uses the entertainment television which children are already watching at home after school as the basis for a supplementary instructional program. The children can hear the dual audio instructor over radio while watching such popular television programs as Gilligan's Island The Flintstones, or Scooby Doo. The dual audio instructor comes on television just before the television program begins and explains how to tune in the dual audio radio program. The television program itself is aired just as it normally would be, and the children keep the television sound at its normal level.

The dual audio instructor does not interrupt the television characters or the commercials. He speaks during the pauses in the television program dialogue, and picks up on the program's content, using it to teach basic skills.

Although dual audio scripts have been prepared to teach reading, science, and general problem solving, recent programming has concentrated on teaching vocabulary, since there is strong evidence linking vocabulary increases to better reading and IQ scores.

The following annotated excerpt from a dual audio script illustrates the way in which the radio commentary is used to teach vocabulary.

EXCERPT FROM A DUAL AUDIO SCRIPT

| | |
|---|---|
| TV Program: | There is trouble under the ocean and the program narrator says that our hero is sent to "investigate." |
| DUAL AUDIO INSTRUCTOR: | "YOU KNOW, TO INVESTIGATE MEANS TO FIND OUT EVERYTHING YOU CAN ABOUT SOMETHING. IT'S LIKE SOLVING A MYSTERY." |
| *Rationale:* | *Definition of "investigate."* |
| TV Program: | The hero begins to poke around. |
| DUAL AUDIO INSTRUCTOR: | "HE MUST HAVE FOUND A CLUE IN HIS INVESTIGATION." |
| *Rationale:* | *Expansion of definition.* |
| TV Program: | The hero spots a building under water. |
| DUAL AUDIO INSTRUCTOR: | "NOW THERE'S SOMETHING TO FIND OUT ABOUT, TO INVESTIGATE!" |
| *Rationale:* | *Implicit re-definition.* |
| TV Program: | Underwater police appear. |
| DUAL AUDIO INSTRUCTOR: | "THOSE POLICE MUST BE INVESTIGATING THE MYSTERY TOO. FROM THEIR POINT OF VIEW, SOMEONE AROUND THAT AREA WOULD BE SUSPICIOUS." |
| *Rationale:* | *Re-emphasis of the concept, "point of view," taught in previous program.* |
| TV Program: | The hero resumes the search. |
| DUAL AUDIO INSTRUCTOR: | "YEAH, INVESTIGATE A LITTLE MORE. TO INVESTIGATE MEANS TO FIND OUT EVERYTHING YOU CAN ABOUT SOMETHING." |
| *Rationale:* | *Re-definition.* |
| TV Program: | The hero uses a searchlight. |
| DUAL AUDIO INSTRUCTOR: | "LOOK AT THAT SEARCHLIGHT! HAVE YOU EVER USED A FLASHLIGHT TO INVESTIGATE SOMETHING?" |
| *Rationale:* | *Application to personal experience.* |

Because the dual audio broadcasts supplement a television program that is already entertaining, they can be heavily instructional and still draw large audiences. However, the dual audio scripts themselves contain a sprinkling of entertainment, with songs, jokes, and stories mixed into the script to increase teaching effectiveness and to help keep the children interested.

Dual audio television scripts are prepared by obtaining television programs from the television station or distributor, previewing them carefully to determine the vocabulary to be taught, and then writing the dual audio instructor's comments. The dual audio instructor broadcasts live from the script while watching the television program on a monitor in the radio station. During commercial breaks, soft music is played on the radio to serve as a locator for children trying to find the station.

## Review Of Previous Research

Studies on dual audio television instruction have been designed to test the basic potential of the idea, to develop it into a form that could be used on a large-scale basis, and to test its effectiveness in actual mass broadcast condictions.

The first study (Borton, 1971) outlined the idea of dual audio, considered some of the possible problems of development and control, and reported on a preliminary test in which small groups of low-income white children in Cambridge, Massachusetts watched short segments of commercial television programs with and without dual audio in a simulated home-viewing situation. The television programs were shown on a video tape recorder, and the dual audio was heard over a manually synched audio tape recorder. Those children who heard the dual audio made half as many mistakes on a test of the material

taught as those who did not hear it.

A series of laboratory tests were conducted in a similar format by the Philadelphia Board of Education's Dual Audio Television Project when it was first established in 1971. The primary purpose of these tests, using both black and white, and low and high income children, was to develop effective styles of dual audio narration, so that children would want to listen to dual audio and would learn from what they heard. A Dual Audio Writer's Handbook was developed describing those methods of dual audio instruction which seemed most effective.

In the Spring of 1972, a one-month field experiment was conducted using 70 low-income black children, some of whom watched the television cartoon Astro-Boy as they usually did on a regular UHF channel, and some of whom could also hear dual audio on small fix-tuned FM receivers loaned to them during the broadcast period. (Borton, Belasco, and Baskerville, 1974) Both groups of children were monitored by their parents who wrote down verbatim what they said and did during the broadcast. The dual audio group listened to dual audio an average of 83% of the time they were watching the television program, and this group also performed significantly higher on tests of the material taught than did the control group.

In the Spring of 1973, a two-month field experiment was conducted using a sample of 400 low-income black children, with dual audio commentary provided for the television cartoon Spiderman (Borton, Belasco, and Echewa, 1974) Four treatment groups were involved: one that simply watched the television program as they normally would without knowledge of dual audio; one that received a little booklet describing for parents how to do their own dual audio for their children, together with bi-weekly leaflets telling them the words being taught by the dual audio instructor; one that was loaned fix-tuned

FM receivers, replicating the group in the previous experiment; and one that was notified about the dual audio program and encouraged to listen on their own FM radios, which an earlier survey had indicated were available in 7[illegible]% of the children's homes. Amount of listening was determined by calling the homes of all children every two weeks during the time the television program was on the air. Those children who were loaned the fix-tuned radios listened an average of 78% of the time they were watching the program; those who used their own radios listened an average of 46% of the time. There was virtually no usage of the booklet. Those children who listened on their own radios performed significantly better than all other groups on tests of the material taught. The results seemed to indicate that although providing the fix-tuned radios produced a greater amount of listening, the use of radios already in the children's homes would be a feasible way of operating a dual audio system on a mass scale.

During the Fall of 1973, another series of formative tests were conducted to try to increase the effectiveness of the dual audio instruction. The formative testing suggested that it was most effective to teach words which were just above the child's level of oral comprehension, which were concrete objects or actions rather than abstractions, which were used in the television program itself, and which had strong visual referents in the television program. Teaching two words a half-hour was more effective than trying to teach more, and using at least three explicit definitions for each word seemed to be necessary in order for the children to grasp them.

The first publicly announced broadcast of dual audio television was conducted in the Spring of 1974, with "Steve," the dual audio instructor, appearing on television to tell watchers of Gilligan's Island how to tune in their FM radios to hear dual audio. The test broadcast ran for two weeks,

and concentrated on teaching words appropriate for the target audience of Title 1 second and third grade, low income black children. (Borton, Belasco, and Williams, 1975) An estimate of audience size was obtained by the American Research Bureau, an independent national audience rating service, and studies of the educational effects of the broadcast were conducted by the Dual Audio Television Project

The American Research Bureau reported that 24% of the six-to-eleven-year-old audience of Gilligan's Island was listening to dual audio daily, with a total audience in the Philadelphia Metropolitan Area of 20,500 persons. In the city of Philadelphia itself, where the majority of the target audience was located, the percentage listening was a little higher (25%), and the total dual audio audience was 25% larger than that of The Electric Company which was being televised at the same time.

To determine the educational impact of dual audio, a sample of 262 Title I and non-Title I second-through-fifth grade children were called at their homes during the times programs were broadcast to determine who was viewing, and who was also listening to dual audio.

An estimate of the number of days of dual audio listening was compiled from this and other information, and correlated with the child's score on an individually administered oral test of the material taught. For the target group of Title I second and third graders, the correlation between number of days listened and test score was + .64. For the Title I fourth and fifth graders, the correlation was + .50. For the non-Title I second and third graders the correlation was + .30. All correlations were significant at the .01 level. When the scores on the vocabulary subtest of the California Achievement Test were partialed out to control for previous vocabulary knowledge,

the correlation for the non-Title I second and third graders was not significant, but that for both Title I groups remained essentially unchanged (+.61 and + .50, respectively).

In summary, the group affected the most was the target audience of Title I second and third graders, who increased their scores by an average of 5% (equivalent to one word) for each day listened.

During the 1974-75 school year a six-month study of dual audio was conducted (Powers, 1975). The study covered half-hour daily dual audio broadcasts accompanying the television series, The Flintstones. Audience estimates were obtained by the American Research Bureau (ARB) and evidence on learning gains were analyzed by the Educational Testing Service (ETS). After three months of broadcasting, ARB estimated that of the six-to-eleven-year-old audience for The Flintstones, 17% were listening to dual audio in the City of Philadelphia and 10% in the Metropolitan Area, for a total audience of 11,000. However, by the end of the fifth month of broadcasting, the dual audio audience had fallen to 1,700 in the Metropolitan Area. It appeared that this drop in audience might be due in part to changes in the weather, and to the fact that The Flintstones was a very tightly scripted show, making it difficult to write appealing dual audio over a long period. The ETS study of learning gains consisted of a correlation between pre-post gain scores on a test of the material taught, and measures of the amount that an individual child listened. A second-order experimental treatment was also developed, using "encouragement to listen" as the independent variable. A sample of 1,524 first-third grade students from both Title 1 and non-Title 1 schools was involved. The results of the study indicated no significant differences in vocabulary learning attributable to the dual audio program. However, a post-hoc analysis of the data revealed several major flaws in the

research design which made the findings unusable. Both the measures of listening and the measures of vocabulary learning turned out to be highly unreliable. Among those children classified in the "high listening" group for instance, many later reported that they had listened less than twelve times. And, because vocabulary learning was measured with a random sample of 20 of the 240 discrete items taught, even if children listened twice a week for the entire six months and the instruction were 100% effective, their score on the vocabulary test would rise only .33 of a point. Such small differences would be difficult to detect in the face of all the other factors that might affect test scores.

Because the 1975 research failed to confirm the pattern of results which had developed in previous research, because these results seemed to be partly a consequence of faulty design or of choosing a TV show which was too fast-paced for effective long-term dual audio narration, and because dual audio seemed to offer great promise if it were effective, it was decided to conduct an additional study, attempting to rectify some of the previous difficulties.

Other Factors Influencing the Study

There are a number of factors, other than previous research results, which led to the choice of the particular TV program for a new test, and which cast the results in a new light. During the Spring of 1975, a major effort was made to discover the potential of dual audio for national dissemination, using a prospectus prepared under the auspices of The Agency for Instructional Television. The prospectus was sent to all chief communications officers of the states and major cities, and personal visits were made to a number of areas to discuss the feasibility of a national cooperative venture to produce and disseminate dual audio. In the course of these discussions, several things

became clear. First, a program such as that originally proposed (using locally-based live narration of previously-prepared scripts) was too expensive for potential sponsors to afford, though they were generally intrigued by the idea. Second, it became clear that it would be much harder to obtain radio time on the public service stations than had been true several years earlier. During 1974-75, the public service stations had become increasingly interested in becoming "listener supported." As a result, many stations were curtailing the varied formats which had characterized them a few years earlier and were concentrating on classical or jazz music and current affairs--the kind of programming which would appeal to those who were potential financial contributors. As a consequence most stations were very reluctant to provide air time during the 4:00 - 6:00 "drive period," which is the period when most of the syndicated daily TV shows for children are broadcast.

The combination of the financial restrictions on live local broadcast and the lack of radio air time for daily afternoon programming meant that the most likely broadcast possibility for dual audio was with the Saturday morning networked children's TV programming. If dual audio could be provided with some of the Saturday morning programs, then there was also the possibility that it could be networked over National Public Radio lines to those areas desiring it, which would save the cost of local narrators. Three educational agencies (two states and one city) agreed to contribute to exploring the networking of dual audio, and the three national TV networks were approached. CBS and ABC both expressed a willingness to conduct a short feasibility study in the summer of 1975, and when this proved successful, the CBS affiliate in Philadelphia (WCAU-TV) agreed to cooperate in a longer test of the effectiveness of dual audio with one of their Saturday morning programs.

A Test of Saturday Morning Dual Audio Programs

During the Fall of 1975, a one month study of dual audio television was conducted, with programming accompanying the CBS network program, Scooby-Doo aired at 9:30 on Saturday mornings. The study concentrated on the month of November, though broadcasts actually ran from November through January. Dual audio was broadcast over WUHY-FM, the local public service radio station during the test period in November, and then switched to WRTI-FM, the Temple University station, after that. As in previous tests, two words were emphasized in each broadcast, and, to the extent possible in the Scooby show, these were words chosen from the language of the characters.

The hypotheses of the study were that there would be a statistically and socially significant difference between listeners and non-listeners on tests of the vocabulary taught, and that the number of listeners in the Philadelphia Metropolitan Area would exceed 10,000 people.

The audience size was determined by The American Research Bureau, using the coincidental method described earlier. The study was conducted during three Saturdays (November 8-22) and involved calling a sample of 2000 households in the Philadelphia Metropolitan Area. (American Research Bureau, 1975).

The vocabulary study involved a combination pre-post and post-only design using comparison groups, though not strict control groups, since random assignment was impossible. The independent variable was listening to the dual audio program. The dependent variable was vocabulary knowledge as measured by a test of the words taught. The method of statistical analysis was an independent t-test between gain scores of listeners and non-listeners for immediate and one-month-retention, and for post-only scores. A correlation was also calculated between immediate gain scores for listeners and non listeners, and the scores of these students on a standard vocabulary test to determine if previous

vocabulary knowledge affected learning from dual audio.

The sample was chosen in the following manner. Six Title I schools were randomly selected from District I in Philadelphia, a district in which most schools are Title I, and four non-Title I schools were randomly selected from District 8, the only district with no Title I schools in it. All children (N=1710) in the third and fourth grades in these schools were given a questionnaire to determine if they watched Scooby rather than the other shows available at 9:30 on Saturday mornings. Four hundred and forty four Title I children, and 452 non Title I children reported watching Scooby, and these children became the population for the study, since it seemed unlikely that non Scooby watchers would switch to Scooby simply because of the availability of dual audio. The national percentile score for the vocabulary subsection of the California Achievement Test, Form B, Spring 1975, was obtained for all Scooby watchers for whom it was available.

The parents of all children, Scooby and non Scooby watchers, received a letter describing the dual audio program which was sent home through the schools to all children in the system. All children in the third and fourth grade in the study schools received a visit from "Steve," the dual audio narrator, in which he told them of the program, and showed them how to tune in an FM radio to the dual audio station. All children who were watching Scooby, whether or not they were in the test group, would have been likely to see on TV a 30 second promotional message in which "Steve" explained the dual audio program before each show and urged children to tune in. All parents of children in the study received a letter through the regular mail telling them that their child was involved in a study of the effects of television upon children, and giving them the option to withdraw their child's name if they wished to do so.

In order to avoid previously experienced difficulties in determining who was listening and whether they had in fact heard the vocabulary words being tested, a new procedure was developed for determining both variables. A randomly selected subsample of about a fourth of both Title I and non Title I children were monitored for each of four Saturdays in November. Telephone monitors were trained by the Project in role play sessions, and followed a detailed protocol. Children were called in the two-hour period immediately following Scooby, and were asked if they had been watching TV, and if so, if they had been watching Scooby.. If they said "yes," they were asked specific questions about that day's show to confirm their answer. If they were "confirmed Scooby watchers" they were asked if they were listening to the radio while watching, and if they answered "yes," they were asked specific questions about that day's dual audio to determine "confirmed listening."

All "confirmed Scooby watchers," listeners and non-listeners, were then asked to define a series of vocabulary words, giving the meaning orally when provided the word without context in the phrase, "Can you tell me what_____means?" Answers were written down verbatim, and scored later by the study staff. Each child was asked the two words which had just been taught on dual audio, and several sets of words from upcoming shows. In effect, each child was receiving a post-only test on the words that had been taught that morning on Scooby, and a pretest on words from the upcoming shows. In one of the three following weeks, each child was called again and was tested on the words just taught on Scooby, for which pretest data had already been collected. A third call a month later tested for retention of those words for which pre-post data was available.

This monitoring procedure had been pretested during the summer, and found to have a number of advantages over those used earlier. Calling the children after the show rather than during it allowed probing to confirm both watching and listening. Testing the children only on those words which they had clearly

either heard or not heard meant that a very precise correlation could be made between the independent variable (listening to the dual audio program) and the dependent variable (vocabulary learning). Since the criterion measure was not a pre-existing vocabulary list, but those words chosen from Scooby which were taught on dual audio, and since some of the children were tested on all the words taught over the test period, their scores could be added together from week to week, providing a sample size which made it possible to clearly assess results even though the number of words each child was tested on was very small. Finally, because the data was collected on a week-by-week basis, it was possible to keep a close check on the effectiveness of the programming, rather than waiting until the end of a six month broadcast period, as in the preceeding year's test.

Results

The American Research Bureau reported that during the period of November 8-22, 1975, Scooby Doo had a rating of 2, a share of 23, and a composite audience of 29,076 in the City of Philadelphia; and a rating of 3, a share of 25, and a composite audience of 71,928 in the Philadelphia Five County Metropolitan Area. Of those watching Scooby 12% or 3,172 were listening to dual audio in the City of Philadelphia, and 9% or 6,814 were listening in the Philadelphia Five County Metropolitan Area. The dual audio audience was composed of 50% males under 6, and 50% males aged 6-11, with no girls reported listening. The total dual audio audience of 6,814 was about 38% of the size of the TV audience for Sesame Street (17,718) which was being broadcast at the same time, though of course to a younger audience.

In the study of learning gains, 53% (N=236) of the 444 Title 1 children and 49% (N=222) of the 452 non-Title 1 children were successfully reached. In the Title 1 group, 42% of those reached (N=100) were watching Scooby, and of these, 22% (N=22) were also listening to dual audio. In the non-Title 1 group, 58% (N=129) were watching Scooby, and of these, 44% (N=57) were also listening to dual audio.

In the Title 1 group, listeners had an immediate pre-post mean gain score of .77, while non listeners had a mean gain of .11, a difference which is significant at the .005 level. The mean post-only score for listeners was 1.0 and for non-listeners .63, a difference significant at the .01 level. In the one month retention test, listeners had a mean gain of .57, while non listeners had a mean gain of .45, a difference which was not significant. A comparison between immediate pre-post gain scores and the California vocabulary subtest for both listeners and non listeners produced a correlation of .35, which is a level that would generally be considered too weak to indicate that vocabulary learning on dual audio was significantly affected by previous vocabulary knowledge.

In the non-Title 1 group, listeners had an immediate pre-post mean gain score of .63, while non listeners had a mean gain of .29, a difference significant at the .025 level. The mean post-only score for listeners was 1.50 and for non-listeners .83, a difference which is significant at the .005 level. In the one month retention test, listeners had a mean gain of .67, while non listeners had a mean gain of .31, a difference significant at the .05 level. A comparison between immediate pre-post gain scores and the California vocabulary subtest for both listeners and non listeners produced a correlation of .07, indicating that there is very little chance that learning from dual audio was significantly affected by previous vocabulary knowledge.

Discussion and Conclusions:

The dual audio audience of 6,814 reported by The American Research Bureau is less than the 20,000 reported in the Gilligan study, but is considerably larger than the 1,700 at the end of the six month broadcast with the Flintstones. It seems likely that part of the larger audience is due to the fact that Scooby is a more slowly paced show than The Flintstones, which means that there is more time for the dual audio narrator to both teach and entertain. Since there was a decrease in the size of the TV audience from The Flintstones (91,165) to Scooby (71,928) the increase in dual audio audience is all the more significant. However, the dual audio audience did not reach the level of 10,000 which had been set as indicative of the range that would be necessary to make national networking feasible.

In both the Title 1 and non-Title 1 groups, dual audio appears to have had a statistically significant effect immediately after broadcast on knowledge of the vocabulary taught. However, this effect persisted one month later only in the non-Title 1 group. This lack of retention is surprising given that the Title 1 group initially showed a bigger difference between listeners and non-listeners than did the non-Title 1 group, and may be accounted for by the very small size of the Title 1 group which could be reached one month later. However, throughout the study the Title 1 children showed a lower percentage of Scooby watchers listening to dual audio (22% compared to 44%), which also suggests that dual audio was not as effective with this group. The efforts to make dual audio programming reach these children--the use of a black narrator, of vocabulary chosen to fit their needs, of examples drawing from their experience--did not seem sufficient to overcome the advantages of greater home involvement in education which the non-Title 1 children seemed to have.

Because the size of the dual audio audience was not at a level which seemed sufficient to generate interest in nationally networked programming, because the instruction appeared to be effective only with a portion of the intended audience, and because of the increasing difficulties in obtaining radio time, it was decided not to continue the further development of dual audio television as a broadcast educational medium.

It is conceivable that at some time in the future the conditions might develop which would make dual audio a practical method of instructing children on a mass scale. These conditions would include: 1) A TV program with both enough "quiet time" for the dual audio narrator to talk, and enough intellectual content for him to talk about. 2) Access to sufficient radio time to make a significant impact. 3) A potential listening population which was sufficiently oriented toward education so that they would go to the necessary trouble to tune in the dual audio programming.

In addition to the simultaneous radio-TV arrangement discussed here for broadcasting dual audio, there are several other systems which could be used and might well be more effective. The first is the broadcast of both the TV image and the dual audio commentary over an unused commercial channel of a cable system. (The educational channel cannot be used because it cannot carry commercial messages.) The use of cable would avoid the necessity of tuning in both a radio and a TV, and so would simplify the reception of the instruction enormously. A second alternative lies in the future--the use of the dual audio capacity of home-based video cassette machines. If the video cassette technology spreads to the point where people are borrowing cassettes from libraries for use on their own machines, then it would certainly be possible to provide a wide range of dual audio commentary which could be recorded on what has come to be called the "dual audio" track of the cassettes. The third alternative is

for the TV producers themselves to build dual audio instruction into their TV programs. In the years since dual audio began its development as a supplementary broadcast medium, TV producers have in fact begun to write more cognitive and social information into their shows. The initial efforts in this direction were rather unfocused and non-sequential, and hence not likely to be effective. However, the evidence on dual audio indicates that it is possible to build effective sequential instruction into an entertainment context, and this is certainly a direction which the TV producers could explore further.

There is no question that television has a profound effect on our children. It is, in fact, a second school system. Dual audio was an attempt to find a way to make that system more conducive to the growth of children. As presently broadcast it does not appear to be an effective means of reaching that goal, but the challenge remains--to help children learn more from the twenty four hours a week they sit before the television.

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